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Economic Effects of Deficit Reduction in Commercial Econometric Models

A Report to the National Economic Commission

Congressional Budget Office
December 7, 1988

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The Congressional Budget Office (CBO) was asked by the National Economic Commission (NEC) staff to report what econometric models tell us about the short-term economic consequences of significant efforts at deficit reduction. Will such efforts cause a recession? If so, can monetary policy prevent this from happening? What differences in economic impacts are caused by variations in the types of measures that are taken to reduce the deficit?

In response, the CBO staff conducted simulations of four different packages of deficit reductions provided by the NEC staff on three commercially available econometric models. Each package consisted of a multiyear program of reductions totaling $120 billion to $130 billion per year over the period 1990-1994.

This statement provides a brief explanation of the model simulations. The first two sections provide short descriptions of the alternative plans for reducing the deficit and of the econometric models. The third section discusses the results of tests to see how close monetary policy could reasonably come to preventing deficit reduction from having any short-term effect on real growth in the gross national product (GNP). The fourth section looks at results based on the hypothetical assumption that monetary policy does not change when deficit reduction takes place. The last section considers the effects of different types of deficit reduction.

The Deficit Reduction Plans

The four deficit-reducing plans, all about the same size, range from an approach involving no revenue increases and no cuts in defense or Social Security, to one in which increases in taxes on income, energy, beer, wine, and cigarettes amount to more than half the total static deficit reduction, and defense and Social Security are

reduced from baseline levels (see Table 1). In each case, cuts in program spending are phased in using annual increments of about $30 billion, rising to between $120 billion and $130 billion by 1994. When interest savings are included, the static deficit reduction involved in each plan would be sufficient to eliminate the entire federal deficit in CBO's August 1988 baseline and convert it to a surplus of around $30 billion to $40 billion by 1994.

Plan 1 involves no tax increases and no reductions from baseline levels of spending for defense or Social Security. Plan 2 shifts the emphasis somewhat to defense, Social Security, and taxes. It holds the growth in defense spending to the baseline rate of inflation, delays Social Security cost-of-living adjustments for one year, and cuts other domestic spending programs as well. After five years, Plan 2 derives about one-fifth of its deficit reduction from increases in income taxes and excises on beer, wine, cigarettes, and energy. Plan 3A emphasizes tax increases: it derives about half of its total program savings after five years from an array of tax increases, including the revenue sources mentioned above, closed loopholes, higher individual income tax rates, and a broad-based energy tax. The other half is drawn from a slowing of growth in defense and entitlements as well as other spending reductions. The last plan, Plan 3B, is the same as Plan 3A except that all revenue assumed in the latter to be gained from a broad-based energy tax is assumed to come instead from greater increases in income taxes.

The Econometric Models

The Congressional Budget Office used three commercial econometric models in this exercise: the Data Resources Inc. (DRI) model (version US86B), the Washington University Macro Model (WUMM, beta test version of November 1988) developed

TABLE 1. ALTERNATIVE DEFICIT-REDUCTION PLANS (Static changes from baseline; fiscal years, in billions of dollars)

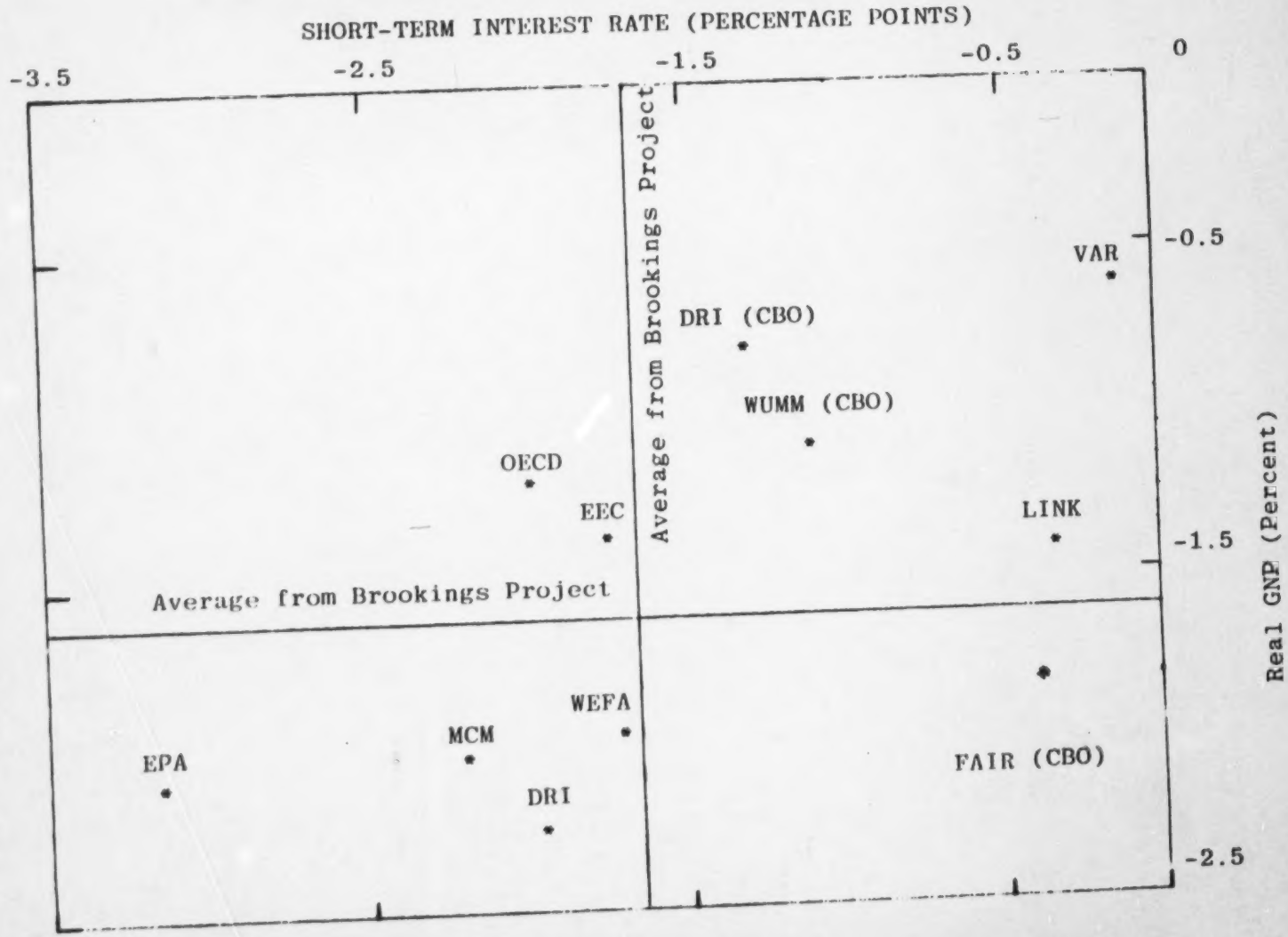
	1990	1991	1992	Cumulative Totals 1990-1992
Plan 1: Restrain Growth to 3.1 Percent per Year				
Total Reduction	-36.3	-60.8	-81.1	-178.2
Outlays	-36.3	-60.8	-81.1	-178.2
Purchases	-9.0	-14.4	-18.8	-42.3
Transfers	-19.6	-33.4	-45.2	-98.1
Other	-7.7	-13.0	-17.1	-37.8
Revenues	0.0	0.0	0.0	0.0
Personal	0.0	0.0	0.0	0.0
Indirect	0.0	0.0	0.0	0.0
Other	0.0	0.0	0.0	0.0
Plan 2: 70 Percent Spending Cuts and 30 Percent Tax Increase				
Total Reduction	-32.1	-58.3	-81.4	-171.8
Outlays	-13.9	-34.3	-55.8	-104.0
Purchases	-5.1	-13.4	-23.0	-41.5
Transfers	-8.0	-18.4	-28.3	-54.7
Other	-0.8	-2.5	-4.5	-7.8
Revenues	18.2	24.0	25.6	67.8
Personal	9.4	14.5	16.0	39.9
Indirect	8.8	9.5	9.6	27.9
Other	0.0	0.0	0.0	0.0
Plan 3A: 50 Percent Spending Cuts and 50 Percent Tax Increase, Including Energy Tax				
Total Reduction	-46.6	-74.4	-90.3	-211.3
Outlays	-8.3	-19.7	-30.2	-58.2
Purchases	-2.8	-6.9	-11.9	-21.6
Transfers	-4.9	-10.9	-15.0	-30.8
Other	-0.6	-1.9	-3.3	-5.8
Revenues	38.3	54.7	60.1	153.1
Personal	6.5	19.6	23.4	49.5
Indirect	30.5	33.2	34.8	98.5
Other	1.3	1.9	1.9	5.1
Plan 3B: 50 Percent Spending Cuts and 50 Percent Tax Increase, No Energy Tax				
Total Reduction	-41.2	-68.5	-84.0	-193.7
Outlays	-8.3	-19.7	-30.2	-58.2
Purchases	-2.8	-6.9	-11.9	-21.6
Transfers	-4.9	-10.9	-15.0	-30.8
Other	-0.6	-1.9	-3.3	-5.8
Revenues	32.9	48.8	53.8	135.5
Personal	22.8	37.4	42.3	102.5
Indirect	8.8	9.5	9.6	27.9
Other	1.3	1.9	1.9	5.1
Addendum:				
CBO August 1988 Deficit	-136.0	-131.3	-126.4	

by Professor Laurence Meyer and his associates, and the FAIR model (reestimated October 1988) developed by Professor Ray Fair of Yale University. The models share an income-expenditure orientation in which changes in federal budgetary and monetary policy exert their short-run economic effects primarily through their effects on aggregate demand. In addition, each of the models incorporates "supply side" theory regarding incentive effects of changes in marginal tax rates, though the estimated effects of changes in many incentives are not strong. The WUMM model goes farthest in this respect, taking account of the effects of marginal personal income tax rates and similar variables on labor supply, saving, and investment. The DRI and WUMM models, unlike the FAIR model, also are equipped to take account of the longer-term effects of deficit reduction in improving the growth rates of the capital stock, of productivity, and of living standards.

How representative are these models of a larger sample of econometric models? Some evidence on this score comes by comparing the estimated deficit reduction effects on real GNP and interest rates without monetary accommodation from the models used by CBO and from a larger group of models used in a study published recently by the Brookings Institution. The Brookings study concentrated on models encompassing economic developments not just in the United States, as was true in CBO's model runs, but in the rest of the world as well. Unlike CBO's simulations, the Brookings study included several models developed by academic economists and by foreign governments and international organizations.

Figure 1 compares the effects of deficit reductions in the various models in the Brookings and CBO studies by plotting the interest rate reduction along the

FIGURE 1. RANGE OF DEFICIT REDUCTION IMPACTS FROM PLAN 1: COMPARISON OF MODELS USED BY CBO AND BROOKINGS (Change from baseline in third year)



SOURCES: Congressional Budget Office; and R. Bryant, D. Henderson, and S. Symansky, "Estimates of the Consequences of Policy Actions Derived from Policy Simulations," in R. Bryant and others, eds., *Empirical Macroeconomics for Interdependent Economies* (Washington, D.C.: Brookings Institution, 1988).

horizontal axis and the percentage reduction in real GNP along the vertical axis.[1] The combinations of reductions in interest rates and real GNP shown in different models are reflected as dots in this plot. The models used by CBO are so labeled. As the figure shows, the models used by CBO yield declines in both GNP and interest rates that are smaller than those of several models used by Brookings, and larger than those in other models. The results produced by these models vary widely; on the average, the three models used by CBO show smaller effects on GNP and interest rates than most.

Economic Effects when Monetary Policy Cushions Fiscal Impacts

The Federal Reserve has suggested that it would take action to lower interest rates and thus stimulate the economy if a significant effort to reduce the deficit were undertaken. The NEC staff asked CBO to perform simulations of the three econometric models described above, using the assumption that the Federal Reserve tries to increase money growth and reduce interest rates in response to deficit reduction measures. The Federal Reserve's offsetting changes were assumed to begin three months in advance of the implementation of the deficit reductions, since the central bank is assumed to know of their pending implementation as soon as they pass Congress. As a first approximation, the models were tested to see if it would be possible, without extreme changes in interest rates, to hold real GNP at approximately the level at which it would have been in the absence of deficit reduction.

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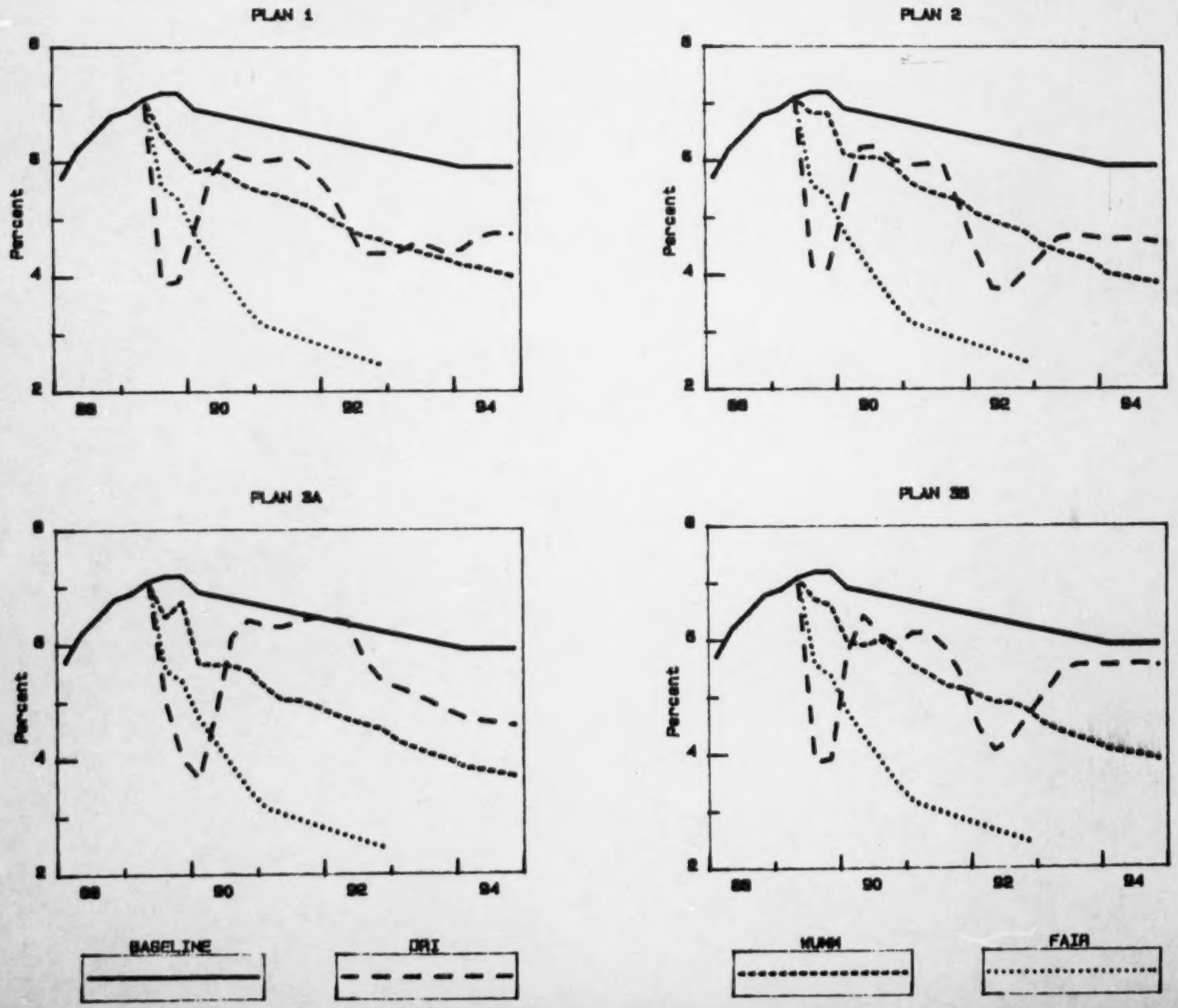
1. For technical reasons, the responses of four models considered by the Brookings project--those incorporating "rational" expectations--could not be calculated for this exercise. Their inclusion would have slightly reduced both the average absolute interest rate and output responses shown in Figure 1.

Effects on GNP and Unemployment. Two of the three models, DRI and WUMM, suggested that reasonable reductions in interest rates engineered by the Federal Reserve could keep GNP close to its original path. The FAIR model also implied that output could be kept near its baseline path, but with less precision and only through declines in interest rates (to less than 2 percent in the third year) that strain credulity. This result occurs because spending is quite insensitive to declines in interest rates and other monetary measures in the FAIR model.

The unemployment rate behaved differently in different models. While none of the models implied that deficit reduction would have a significant effect on employment, the WUMM model implied that reductions in transfer payments could make more people look for work and thus raise unemployment by as much as 0.3 percentage point, while the FAIR model hypothesized that increases in personal and taxes could discourage people from looking for work and thus reduce unemployment, also by about 0.3 percentage point. Unemployment was roughly unchanged in DRI.

Effects on Interest Rates and Growth in Money Supply. The decline in interest rates that is needed in the DRI and WUMM models to keep real output unchanged is between one and three percentage points on average over the five-year simulation period, while in the FAIR model it is between three and four percentage points (see Figure 2). There are, however, significant differences among the models regarding both the pattern of interest rate declines and the degree of acceleration of growth in the narrow money supply (M1) that would be needed to accomplish them. The DRI model implies that a relatively sharp initial interest-rate decline of three percentage points would be needed, followed by a recovery of rates to a level much

FIGURE 2. EFFECTS OF DEFICIT REDUCTION ON SHORT-TERM INTEREST RATES, WITH MONETARY ACCOMMODATION



closer to their baseline on average. The WUMM and FAIR models, by contrast, imply that interest rates would have to fall only slightly at first, but would then fall further and further below the baseline level to hold real GNP unchanged. The growth in money supply associated with these patterns in rates varies from a temporary acceleration in the DRI model to a sustained increase in money growth in the WUMM and FAIR models.

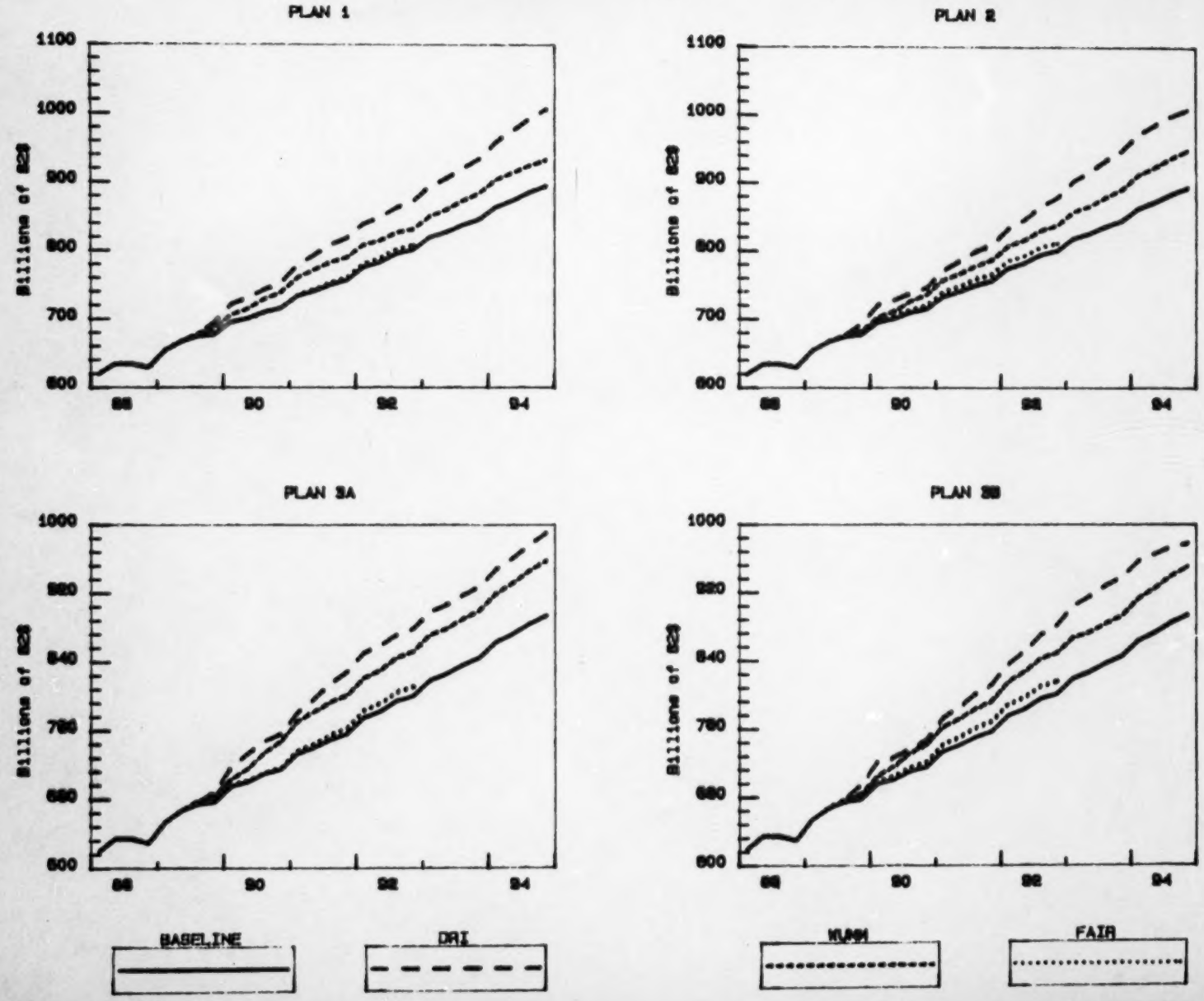
Effects on Prices. In the DRI and FAIR models, the only significant effect on prices from any of the deficit reduction plans is a one-time effect on consumer prices that stems from the increases in excise taxes in Plans 2, 3A, and 3B. Even these tax increases, however, do not significantly affect pretax prices; it is only their direct reflection of the higher tax rate that makes the price indexes rise. There are negligible effects on the inflation rate after the quarter in which the tax increases are first imposed. The WUMM simulation without tax increases (Plan 1) also shows no significant effect on inflation. However, the WUMM simulations of Plans 2, 3A, and 3B exhibit an increase in inflation beyond the direct effect of the excise tax. The inflation rate in the Consumer Price Index (CPI) increases by about half a percentage point in that model during the first three years after the tax increase, and then returns to baseline levels with the price level permanently higher. The stronger inflation results from the model's prediction that price increases reflecting the tax increase give rise in later wage negotiations to compensating wage increases. Moreover, under the assumed monetary policy that holds unemployment at current rates and thus keeps labor markets tight, wage demands such as these result in greater inflation than when unemployment is higher.

Overall Effects on the Federal Deficit. The lower interest rates caused in these models by deficit reductions reduce the deficit beyond the amount assumed in the original estimates of budgetary impact. The models estimate that the deficit declines by an average of 35 percent more than the original (static) impact of Plans 1 through 3B.

Long-run Effects. The models suggest that deficit reduction through any of the four plans shifts the composition of real GNP toward greater private investment and stronger real net exports (see Figure 3). For DRI and WUMM, the rise in real investment plus net exports averages 7 percent after five years. The increases in investment come mainly in the residential category and are brought about primarily by reductions in interest rates. The effects of these reductions are strong enough to offset the investment-dampening effects of increases in marginal tax rates in some of the simulations. The effects are similar in FAIR, but smaller.

The shift toward stronger growth in nonresidential investment (though small) and in net exports reflects higher national saving, primarily by the federal government. The shift suggests that real GNP growth will eventually be stronger than before deficit reduction. Stronger investment will ultimately lead to improvements in productivity. The permanent increase in GNP growth from this source takes time to appear, however, and is barely perceptible during the five-year period covered by the model results developed here. Increased real net exports, for their part, reduce U.S. indebtedness to foreigners, and therefore mean that GNP improves because of smaller payments of interest and dividends to foreign creditors.

FIGURE 3. EFFECTS OF DEFICIT REDUCTIONS ON INVESTMENT PLUS NET EXPORTS, WITH MONETARY ACCOMMODATION

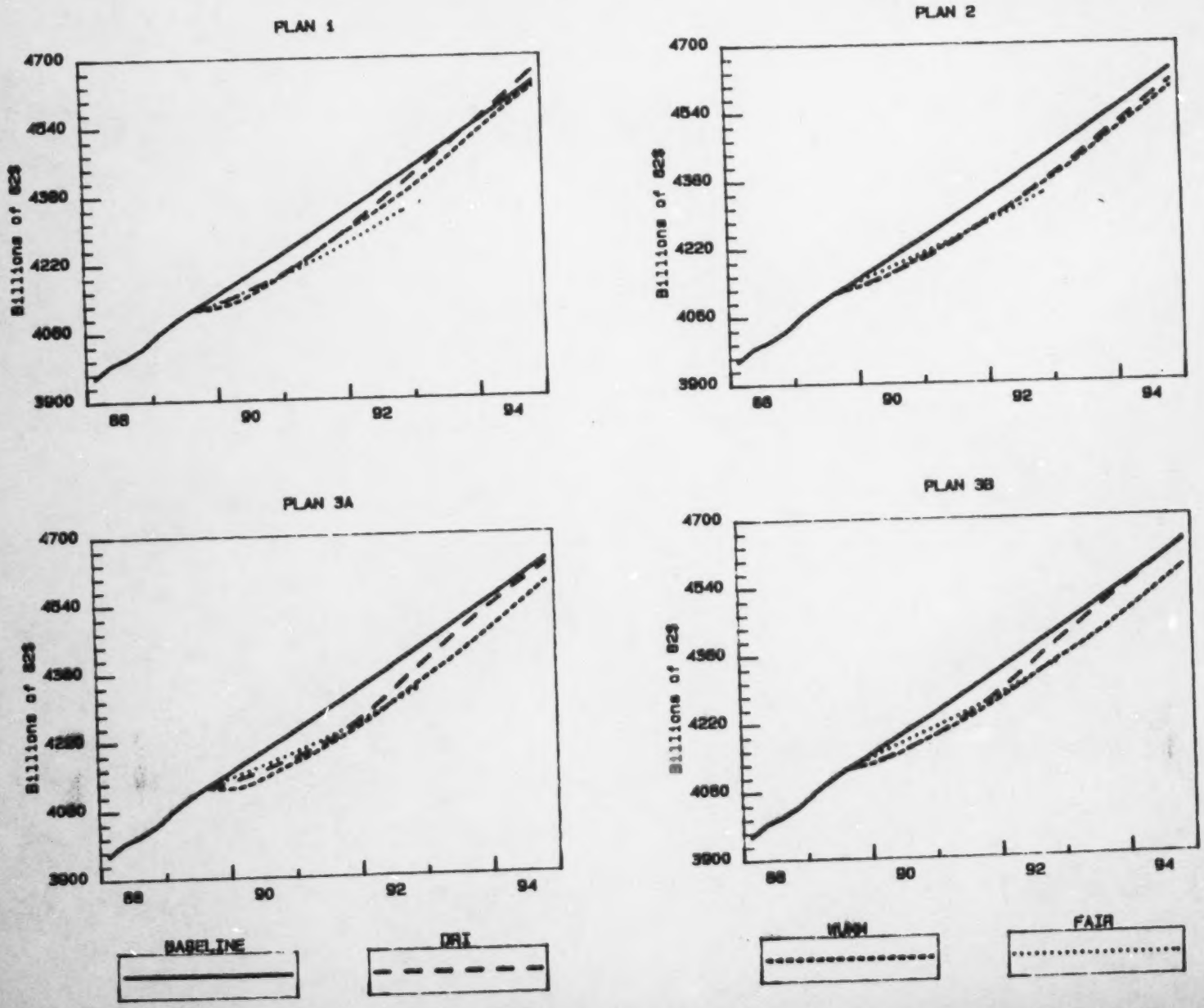


Economic Effects of Deficit Reduction without Monetary Offset

This basic option was used at the request of the NEC staff, not because it is believed that the monetary authorities in fact ignore major fiscal policy changes, but to pose the question, "suppose, for whatever reason, monetary policy remained the same." In that sense it represents the worst-case alternative.

Effects on Real GNP and Unemployment. All three of the models simulated by CBO suggest that the deficit reductions contemplated in the four plans would weaken the pace of economic expansion and raise unemployment. However, only in the FAIR model does this slowdown persist through 1992. In the WUMM and DRI models, GNP eventually recovers from the initial shortfall and approaches or even exceeds the baseline by 1994. Even without any monetary adjustment, none of the models shows a slowdown sufficient to qualify as a recession. But the weakening caused by fiscal retrenchment is significant, averaging 1 percent of baseline real GNP in the three models over the first three years (see Figure 4). The higher unemployment over three years averages half a percentage point. The slowdown occurs in part because the reductions in certain types of federal spending (purchases of goods and services) would directly reduce real GNP. Increases in income tax rates reduce output through incentive effects; reductions in transfer payments and increases in taxes, while they are not reflected directly in GNP, would reduce disposable incomes and thus cut private spending that supports the demand for goods and services.

FIGURE 4. EFFECTS OF DEFICIT REDUCTIONS ON REAL GNP, WITH THE PATH OF M1 HELD CONSTANT

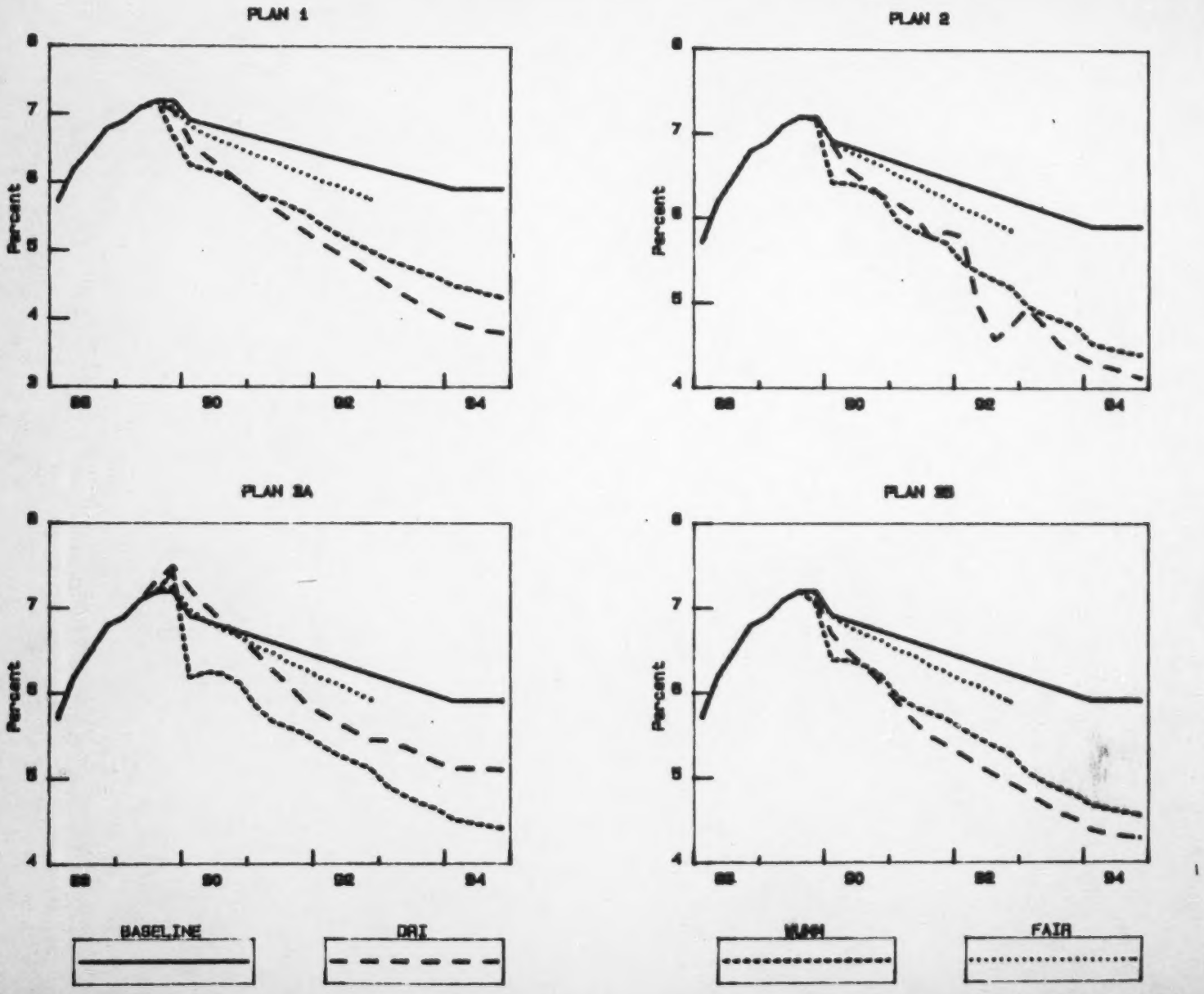


Effects on Interest Rates and Growth in Money-Supply. The economic weakening is only temporary in the WUMM and DRI models, largely because they suggest that deficit reduction would also cause interest rates to fall even without any policy response from the monetary authorities. Short-term interest rates in these two models fall by about one percentage point on average by 1992, and by one and a half percentage points by the fifth year (see Figure 5). The FAIR model, on the other hand, has the short-term interest rate declining by only one-third of a percentage point by 1992, an amount too small to generate enough growth in private spending to nullify the weakening caused by deficit reduction.

Effects on Prices. In the DRI and FAIR models, the only significant effects on prices from any of the deficit reduction plans stems from increases in excise taxes (Plans 2, 3A, and 3B). There are negligible effects on the inflation rate in the CPI after the quarter in which the tax increases are imposed. In the WUMM model, by contrast, the price indexes fall by about one percent in these simulations even when indirect taxes are increased. The decline reflects the increase in unemployment caused by the deficit reduction, both through its effects on GNP and its effects in increasing labor supply among those whose transfer payments are cut.

Overall Effects on the Federal Deficit. The reduction in the overall federal deficit is weaker in the simulations without offsetting monetary policy, since tax revenues fall because of economic weakening and because interest rates do not decline as much as they did in the previous simulations. Taking these factors into account, the three econometric models suggest that by 1992, the overall deficit falls by 20 percent less on average than the targets for program savings set out in the plans. Lower tax

FIGURE 5. EFFECTS OF DEFICIT REDUCTION ON SHORT-TERM INTEREST RATES, WITH THE PATH OF M1 HELD CONSTANT



receipts are the dominant factor causing the shortfall in deficit reduction. By 1994 the overall shortfall in deficit reduction in the DRI and WUMM models is only slightly below the program savings.

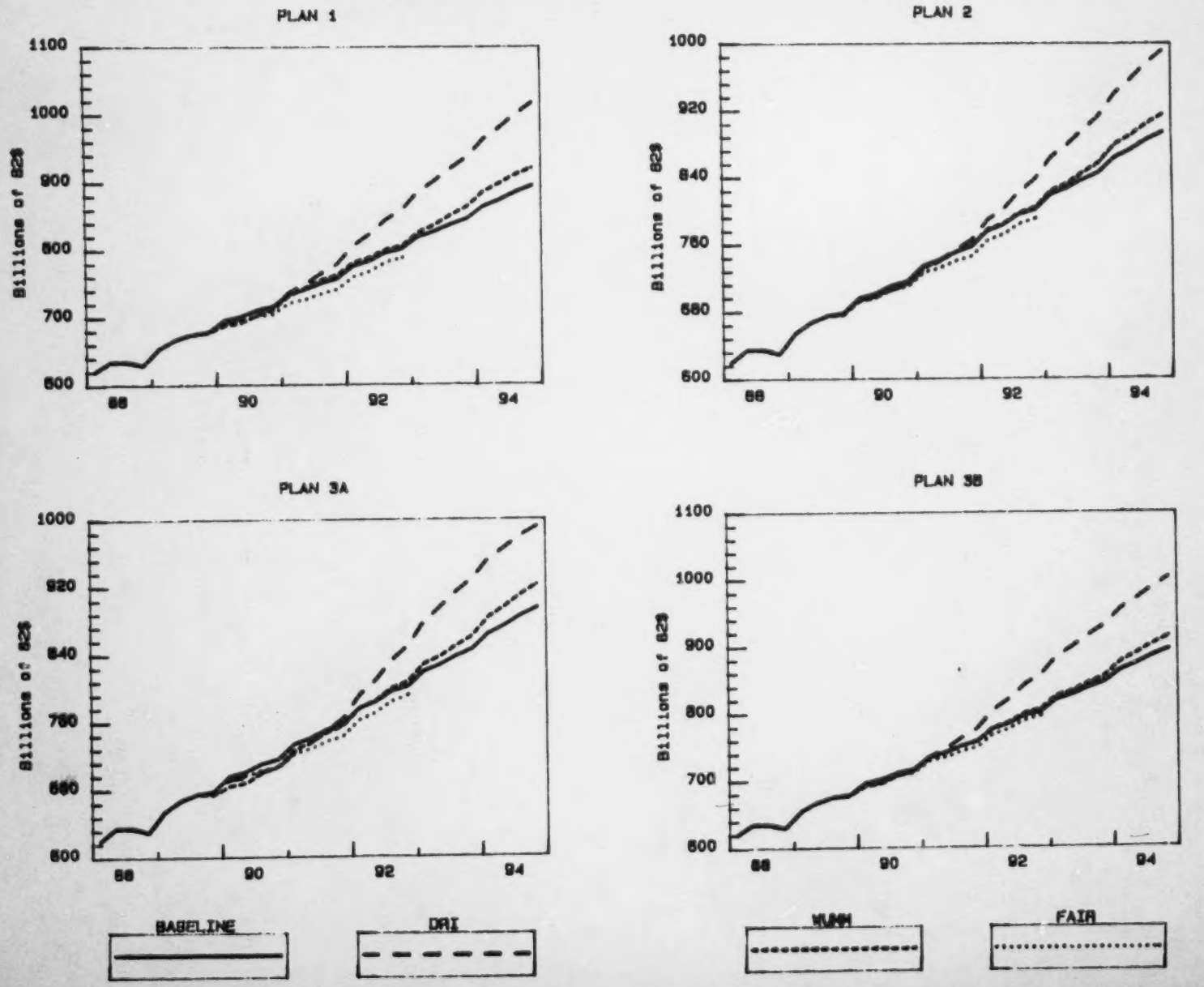
Long-run Effects. Because interest rates fall less than in the simulations with a monetary policy offset, the increases in domestic fixed investment are smaller in all of the model simulations (see Figure 6). The smaller fall in interest rates also causes a lesser decline in the dollar, which is part of the reason for a stronger increase in real net exports. Again, however, the increases in real GNP growth relative to the baseline that should stem from the resulting gains in productivity and payments to foreign creditors are not evident over the relatively short interval covered by these simulations. The FAIR model produces a much smaller shift in the composition of real GNP.

Effects of Different Types of Deficit Reductions

The three econometric models are not able to distinguish reliably among the quantitative economic effects of the different provisions in these plans. In general, the different models do not agree on how much a given plan affects a given economic variable, and by how much more or less a different plan would affect it.

A few qualitative generalizations about the effects of different fiscal measures in these models are possible, though they are generally not evident in comparisons among the results of CBO's simulations because of differences of timing and because several measures are combined in each plan. All the models indicate that real GNP reacts more negatively to reductions in federal purchases than to reductions in transfers or grants. Income tax increases through marginal tax rates

FIGURE 6. EFFECTS OF DEFICIT REDUCTION ON INVESTMENT PLUS NET EXPORTS, WITH THE PATH OF M1 HELD CONSTANT



have stronger negative effects than base-broadening measures such as restrictions on many deductions. Excise taxes have relatively strong contractionary effects in two of the models because, in addition to reducing real disposable incomes directly, the price increases they bring about reduce real wealth and the real money supply. Both of these additional effects reduce demand--the first by increasing saving, and the second by raising interest rates.